Keywords: ATP-EMTP**,** Back flashover faults, Lightning strokes, Surge arrester, Transmission lines.

Abstract

Back flashover faults resulting from lightning strokes hitting the shield wire(s) or tower(s) are one of the major causes of power interruptions on the double-circuit 69/138 kV overhead transmission lines in Jamaica. Computational analysis with the aid of Alternative Transient Program-Electromagnetic Transient Program **(**ATP-EMTP) simulations was performed on a section of the affected lines to identify the main factors causing back flashover faults with an attempt to reduce the effects and to improve both power reliability and financial losses. A model of the selected line section suitable for transient overvoltage studies was developed to investigate fast transient studies of flashover occurrences of the line insulator with respect to lightning amplitudes and wave fronts; as well as the tower footing impulse resistances and the tower surge impedance. The results show that the 69 kV transmission line was more sensitive to flashover faults, which was due mainly to its relatively lower basic lightning impulse insulation level (BIL) of the line insulators, compared to the 138 kV line. However, the results also indicate that the installation of surge arresters on the affected towers significantly reduce the transient overvoltages well below the insulators' withstand voltages and thereby providing effective protection against back flashover faults. The energies absorbed by the surge arresters were also investigated and presented herein.